

Abstract

CFLOBDDs are a new compressed representation of functions over Boolean-valued arguments. They provide an alternative to the now-standard representation provided by Ordered Binary Decision Diagrams (OBDDs) and Multi-Terminal Binary Decision Diagrams (MTBDDs) (also known as Algebraic Decision Diagrams (ADDs)). CFLOBDDs share many of the good properties of OBDDs and MTBDDs, but can lead to data structures of drastically smaller size—exponentially smaller than OBDDs and MTBDDs, in fact. That is, OBDDs and MTBDDs are data structures that—in the best case—yield an exponential reduction in the size of the representation of a function (i.e., compared with the size of the decision tree for the function). In contrast, a CFLOBDD—again, in the best case—yields a doubly exponential reduction in the size of the representation of a function.

Obviously, not every function has such a highly compressed representation, but the potential advantage of CFLOBDDs over OBDDs and MTBDDs is that they can allow data (e.g., functions, matrices, graphs, relations, circuits, signals, etc.) to be stored in a much more compressed fashion. Application areas include, but are not limited to:

- analysis, synthesis, optimization, simulation, test generation, timing analysis, and verification of hardware systems
- analysis and verification of software systems
- use as a runtime data structure in software application programs
- data compression and transmission of data in compressed form
- spectral analysis and signal processing
- use as a runtime data structure in solvers for integer-programming, network-flow, and genetic-programming problems

In such applications, CFLOBDDs have the potential to

- permit problems to be solved much faster, and
- allow much larger problems to be attacked than has previously been possible.